

WHAT IS CLAIMED IS:

- 1           1.       A method, comprising:  
2           generating topology information including information on local interfaces in a  
3           device and remote interfaces in at least one remote device that connect to the local  
4           interfaces identified in the topology information;  
5           for each connected remote interface, determining a device type of the one remote  
6           device including the remote interface; and  
7           for each local interface connecting to one remote interface in one remote device  
8           of a specified device type, initiating communication with the remote interface to access  
9           remote topology information from the remote device indicating devices attached directly  
10          and indirectly to the remote device.
  
- 1           2.       The method of claim 1, further comprising:  
2           merging the topology information with the remote topology information.
  
- 1           3.       The method of claim 1, wherein the specified device type comprises an  
2           expander.
  
- 1           4.       The method of claim 1, further comprising:  
2           receiving at the remote device a request for the remote topology information  
3           from the device;  
4           determining at the remote device whether the remote topology information is  
5           completed; and  
6           transmitting the remote topology information to the device in response to  
7           determining that the remote topology information is completed.
  
- 1           5.       The method of claim 4, wherein the remote topology information is  
2           completed if the remote topology information indicates information on devices to which  
3           the remote device is directly and indirectly connected.

1           6.     The method of claim 5, wherein the remote topology information is  
2 completed in response to completing:  
3           determining the device type of at least one additional device to which the remote  
4 device connects;  
5           receiving additional topology information from the at least one additional device  
6 to which the remote device connects that is of the specified device type; and  
7           merging the received additional topology information with the remote topology  
8 information .

1           7.     The method of claim 1, wherein the topology information and remote  
2 topology information include information on downstream devices.

1           8.     The method of claim 7, wherein one downstream device comprises an end  
2 device or an expander providing a direct or indirect connection to further end devices that  
3 may be connected to through the downstream expander.

1           9.     The method of claim 1, wherein the topology information includes an  
2 entry for devices to which the device including the completed topology information  
3 connects directly or indirectly, wherein each entry indicates a first address and first  
4 interface of a first device, a second address and second interface of a second device  
5 connected directly to the first device, and a device type of the second device, wherein the  
6 device including the topology information connects directly or indirectly to all first and  
7 second devices identified in the topology information.

1           10.    The method of claim 1, wherein the devices comprise SAS devices and  
2 wherein the interfaces comprise SAS PHYs, and wherein each device in the topology has  
3 a unique SAS address.

1           11.    A system in communication with at least one remote device, wherein each  
2 remote device includes at least one remote interface and remote topology information,  
3 comprising:

4 at least one local interface;  
5 circuitry capable of causing operations to be performed, the operations  
6 comprising:  
7 (i) generating topology information including information on local  
8 interfaces and remote interfaces in at least one remote device that connect to the  
9 local interfaces identified in the topology information;  
10 (ii) for each connected remote interface, determining a device type of the  
11 one remote device including the remote interface; and  
12 (iii) for each local interface connecting to one remote interface in one  
13 remote device of a specified device type, initiating communication with the  
14 remote interface to access remote topology information from the remote device  
15 indicating devices attached directly and indirectly to the remote device.

1 12. The system of claim 11, wherein the operations further comprise:  
2 merging the topology information with the remote topology information.

1 13. The system of claim 11, wherein the specified device type comprises an  
2 expander.

1 14. The system of claim 11, wherein the topology information and remote  
2 topology information include information on downstream devices, wherein one  
3 downstream device comprises an end device or an expander providing a direct or indirect  
4 connection to further end devices that may be connected to through the downstream  
5 expander.

1 15. The system of claim 11, wherein the topology information includes an  
2 entry for devices to which the device including the completed topology information  
3 connects directly or indirectly, wherein each entry indicates a first address and first  
4 interface of a first device, a second address and second interface of a second device  
5 connected directly to the first device, and a device type of the second device, wherein the

6 device including the topology information connects directly or indirectly to all first and  
7 second devices identified in the topology information

1 16. A system in communication with at least one remote device and one  
2 upstream device, wherein each remote device includes at least one remote interface and  
3 remote topology information, comprising:

4 at least one local interface;

5 circuitry capable of causing operations to be performed, the operations  
6 comprising:

7 (i) receiving a request for remote topology information from the upstream  
8 device, wherein the remote topology information includes information on the at  
9 least one local interface and remote devices in communication with the at least  
10 one local interface;

11 (ii) determining whether the remote topology information is completed;  
12 and

13 (iii) transmitting the remote topology information to the upstream device  
14 in response to determining that the remote topology information is completed.

1 17. The system of claim 16, wherein the remote topology information is  
2 completed if the remote topology information indicates information on downstream  
3 devices to which the remote device is directly and indirectly connected.

1 18. The system of claim 16, wherein the remote topology information is  
2 completed in response to the circuitry completing:  
3 determining the device type of at least one additional connected remote device;  
4 receiving additional topology information from the at least one additional  
5 connected remote device that is of the specified device type; and  
6 merging the received additional topology information with the remote topology  
7 information .

1           19.    A system in communication with at least one remote device, wherein each  
2 remote device includes at least one remote interface and remote topology information,  
3 comprising:

4           at least one local interface;

5           a motherboard;

6           circuitry integrated with the motherboard capable of causing operations to be  
7 performed, the operations comprising:

8                   (i) generating topology information including information on the at least  
9 one local interface and remote interfaces in at least one remote device that  
10 connect to the local interfaces identified in the topology information ;

11                   (ii) for each connected remote interface, determining a device type of the  
12 one remote device including the remote interface; and

13                   (iii) for each local interface connecting to one remote interface in one  
14 remote device of a specified device type, initiating communication with the  
15 remote interface to access remote topology information from the remote device  
16 indicating devices attached directly and indirectly to the remote device.

1           20.    The system of claim 19, wherein the operations further comprise:  
2 merging the topology information with the remote topology information.

1           21.    The system of claim 20, wherein the specified device type comprises an  
2 expander.

1           22.    An article of manufacture in communication with at least one remote  
2 device, each remote device having at least one interface, wherein the article of  
3 manufacture is capable of causing operations to be performed, the operations comprising:

4           generating topology information including information on local interfaces and  
5 remote interfaces in at least one remote device that connect to the local interfaces  
6 identified in the topology information ;

7           for each connected remote interface, determining a device type of the one remote  
8 device including the remote interface; and

9           for each local interface connecting to one remote interface in one remote device  
10   of a specified device type, initiating communication with the remote interface to access  
11   remote topology information from the remote device indicating devices attached directly  
12   and indirectly to the remote device.

1           23.    The article of manufacture of claim 22, wherein the operations further  
2   comprise:

3           merging the topology information with the remote topology information.

1           24.    The article of manufacture of claim 22, wherein the specified device type  
2   comprises an expander.

1           25.    The article of manufacture of claim 22, wherein the topology information  
2   and remote topology information include information on downstream devices, wherein  
3   one downstream device comprises an end device or an expander providing a direct or  
4   indirect connection to further end devices that may be connected to through the  
5   downstream expander.

1           26.    The article of manufacture of claim 22, wherein the topology information  
2   includes an entry for devices to which the device including the completed topology  
3   information connects directly or indirectly, wherein each entry indicates a first address  
4   and first interface of a first device, a second address and second interface of a second  
5   device connected directly to the first device, and a device type of the second device,  
6   wherein the device including the topology information connects directly or indirectly to  
7   all first and second devices identified in the topology information.

1           27.    An article of manufacture in communication with at least one remote  
2   device and an upstream device, wherein each remote device includes at least one remote  
3   interface and remote topology information, wherein the article of manufacture is capable  
4   of causing operations to be performed, the operations comprising:

5           receiving a request for remote topology information from the upstream device,  
6   wherein the remote topology information includes information on the at least one local  
7   interface and remote devices in communication with the at least one local interface;  
8           determining whether the remote topology information is completed; and  
9           transmitting the remote topology information to the device in response to  
10   determining that the remote topology information is completed.

1           28.    The article of manufacture of claim 27, wherein the remote topology  
2   information is completed if the remote topology information indicates information on  
3   devices to which the remote device is directly and indirectly connected.

1           29.    The article of manufacture of claim 27 wherein the remote topology  
2   information is completed in response to completing:  
3           determining the device type of at least one connected additional device;  
4           receiving additional topology information from the at least one additional  
5   connected device that is of the specified device type; and  
6           merging the received additional topology information with the remote topology  
7   information .